

BUREAU OF WATER

South Carolina Department of Health and Environmental Control

SHELLFISH MANAGEMENT AREA 16B

2004 ANNUAL UPDATE

Shellfish Sanitation Program

Water Monitoring, Assessment and Protection Division
Environmental Quality Control - Bureau of Water
2600 Bull Street
Columbia, South Carolina 29201

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2004 ANNUAL UPDATE

[Data Thru December 2003]

Shellfish Management Area 16B Shellfish Sanitation Program



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ANNUAL UPDATE
Shellfish Management Area 16B
SCDHEC EQC Bureau of Water

Data Inclusive Dates:

01/01/01 thru 12/31/03

Classification Change:

 Yes X No

Shoreline Survey Completed: Yes

(I)ncreased/(D)ecreased/(N)one:

 N Approved

 N Cond.

 N Restricted

 N Prohibited

Prior Report & Date: Annual -2003

SUMMARY

Only five of the sixteen sampling stations in Shellfish Management Area 16B have estimated 90th percentile MPN values greater than 10 (ten). This is indicative of the excellent water quality in the Area. The Area 16B growing area is somewhat isolated from freshwater inflow and, having four inlets, normally exhibits a higher salinity range, typical of near-shore coastal waters.

Sampling at three new sampling stations, 33, 34, and 35, in Skull Creek, began on January 8, 2001. Each station currently has 35 sample results for the review period and all three stations meet Approved area criteria.

The bacteriological and shoreline survey data indicate that Area 16B is properly classified. Based upon this report, no classification changes will be implemented.

INTRODUCTION

PURPOSE AND SCOPE

The authority to regulate the harvest, sanitation, processing and handling of shellfish is granted to the South Carolina Department of Health and Environmental Control by Section 44-1-140 of the Code of Laws of South Carolina, 1976, as amended. The Department promulgated Regulation 61-47 which provides the rules used to implement this authority and outlines the requirements applied in regulating shellfish sanitation in the State. This regulation specifically addresses classification of shellfish harvesting areas and requires that all areas be examined by sanitary and bacteriological surveys and classified into an appropriate shellfish harvesting classification.

The National Shellfish Sanitation Program (NSSP) Guide For The Control Of Molluscan Shellfish is used by the United States Food and Drug Administration (USFDA) to evaluate state shellfish sanitation programs. The NSSP Model Ordinance requires that a sanitary survey be in place for each

growing area prior to its use as a source of shellfish for human consumption and prior to the area's classification as Approved, Conditionally Approved, Restricted, or Conditionally Restricted. Each sanitary survey shall be updated on an annual basis and accurately reflect changes which have occurred within the area. Requirement of the annual reevaluation include, at a minimum, field observations of pollution sources, an analysis of water quality data consisting of the past year's data in combination with appropriate previously collected data, review of reports and effluent samples from pollution sources, and review of performance standards for discharges impacting the growing area. A brief report documenting the findings shall also be provided.

The following criteria consistent with the NSSP Model Ordinance and S. C. Regulation 61-47 are used in establishing shellfish harvesting classifications:

Approved - Growing areas shall be classified Approved when the sanitary survey concludes that fecal material, pathogenic microorganisms, and poisonous or deleterious substances are not present in concentrations which would render shellfish unsafe for human consumption. The Approved area classification shall be designated based upon a sanitary survey which includes water samples collected from stations in the designated area adjacent to actual or potential sources of pollution. For waters sampled under adverse pollution conditions, the median fecal coliform Most Probable Number (MPN) or the geometric mean MPN shall not exceed fourteen per one hundred milliliters, and not more than ten percent of the samples shall exceed a fecal coliform MPN of forty-three per one hundred milliliters (per five tube decimal dilution). For waters sampled under a systematic random sampling plan, the geometric mean fecal coliform Most Probable Number (MPN) shall not exceed fourteen per one hundred milliliters, and the estimated ninetieth percentile shall not exceed an MPN of forty three (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP Guidelines.

Conditionally Approved - Growing areas may be classified Conditionally Approved when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be adopted by the Department prior to classifying an area as Conditionally Approved. Where appropriate, the management plan for each Conditionally Approved area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems, evaluation of each source of pollution, and means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate.

Restricted - Growing areas shall be classified Restricted when sanitary survey data show a limited degree of pollution or the presence of deleterious or poisonous substances to a degree which may cause the water quality to fluctuate unpredictably or at such a frequency that a Conditionally Approved classification is not feasible. Shellfish may be harvested from areas classified as Restricted only for the purposes of relaying or depuration and only by special permit issued by the Department and

under Department supervision. For Restricted areas to be utilized as a source of shellstock for depuration, or as source water for depuration, the fecal coliform geometric mean MPN of restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Conditionally Restricted - Growing areas may be classified Conditionally Restricted when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be prepared by the Department prior to classifying an area as Conditionally Restricted. Where appropriate, the management plan for each Conditionally Restricted area shall include performance standards for sources of controllable pollution (e.g., wastewater treatment and collection systems and an evaluation of each source of pollution) and description of the means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish may be harvested from areas classified as Conditionally Restricted only for the purposes of relaying or depuration and only by permit issued by the Department and under Department supervision. For Conditionally Restricted areas to be utilized as a source of shellstock for depuration, the fecal coliform geometric mean MPN of Conditionally Restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Prohibited - Growing areas are classified Prohibited if there is no current sanitary survey or if the sanitary survey or monitoring data show unsafe levels of fecal material, pathogenic microorganisms, or poisonous or deleterious substances in the growing area or indicate that such substances could potentially reach quantities which could render shellfish unfit or unsafe for human consumption.

BACKGROUND INFORMATION

Shellfish Management Area 16 was divided into Areas 16A and 16B in 1999.

Shellfish Management Area 16B consists of 31,516 acres of shellfish growing area habitat located in Beaufort County. The Area includes the Harbor River / Trenchards Inlet area between

Hunting Island, Fripp Island and St. Helena Island and tributaries including Story River, Station Creek, Old House Creek, Fripp Inlet, Skull Inlet, and Pritchard's Inlet.

The area's northern boundary starts at the intersection of Highway 21 and Seaside Road (SR-77) and parallels Highway 21, crossing Harbor River to the shore of Harbor Island. The eastern boundary is the Atlantic Ocean. The southern boundary extends along the shores of Fripp and Pritchards Islands southwestward to Trenchards Inlet. The western boundary is an imaginary line drawn between Morse Island Creek (part of Area 15) and Station Creek which then parallels Seaside Road (SR 77) ending at the intersection with Highway 21.

Area 16B is largely rural, with large areas of agricultural land, particularly on St. Helena Island, used for growing vegetables and sod. Shrimp boat docks are located on Wards Creek and Station Creek. There are residential developments on Fripp Island (including two golf courses and a marina) and Harbor Island. A South Carolina state park and campground is located on Hunting Island. The Area 16B growing area is somewhat isolated from freshwater inflow and, having 4 inlets, normally exhibits a salinity range typical of near-shore coastal waters. Shellfish Culture Permit areas and State Shellfish Grounds are designated within the area. Clams are harvested to a greater extent than are oysters. Two clam mariculture operations are located within Area 16B.

The harvesting classifications of Area 16B prior to this survey were as follows:

- 1) Fripp Island Marina closure zone;
- 2) Fripp canal, from Station 06F at Old House Creek to its confluence with Skull Inlet;
- 3) Gay Fish Company shrimp dock (marina) closure zone.

Restricted: None

Conditionally Approved: None

Approved: The remaining waters of Area 16B

The shellfish industry in South Carolina is based mainly on the harvest of the eastern oyster (*Crassostrea virginica*) and hard clams (*Mercenaria sp.*). Areas in South Carolina designated for commercial harvest by the South Carolina Department of Natural Resources (SCDNR) include State Shellfish Grounds, Culture Permits, and Kings Grant areas. There are three shellfish Culture Permit areas in Area 16B. Culture Permits C-097, 102, and 103 are leased to L.P. Maggioni & Company. Mariculture Permit (M-103), formerly Atlantic Farms, is located within the boundary of Culture Permit 103.

The general public is allowed to harvest on four state shellfish grounds in Area 16B. State Shellfish Ground 100 (S-100) is in Trenchards Inlet, S-101 is in Station Creek, S-106 is in Old House Creek, and S-108 is in Johnson Creek. Recreational harvesting is allowed for clams and oysters in all areas, and commercial harvesting by licensed individuals is allowed on all except Johnson Creek SSG, subject to seasons established by SCDNR. Shellfish harvesting season in South Carolina extends from

September 16 through May 15, although actual dates may vary. SCDNR has the authority to alter the shellfish harvest season for management purposes. The South Carolina Department of Health and Environmental Control has the authority to prohibit shellfish harvesting when necessary to ensure that all shellfish harvested in South Carolina waters are safe for human consumption.

POLLUTION SOURCE SURVEY

SURVEY PROCEDURES

Shoreline surveys of Area 16B were conducted by the Low Country District Shellfish Sanitation staff, by watercraft, vehicle, and on foot, during the survey period, and are ongoing.

POINT SOURCE POLLUTION

Major sources of actual or potential pollution (See Figure 4):

PERMITTED FACILITIES	PERMIT #/TYPE/ DISCHARGE
Hunting Island State Park WWTP	SC0025054 / 0.10 / Wetlands
Fripp Island PSD WWTP	ND0065919 /0.34 MGD/Spray Irrigation
BJWSA St. Helena WWTP	SC0039811 / 0.6 MGD /Spray Irrigation
Fripp Island Marina	Marina /with pump-out
Gay Fish Company	Marina (Commercial Dock)

- A. Municipal and Community** Waste Treatment Facilities - New sewer lines, serving schools and businesses and new subdivisions, have been installed and extend from Lady's Island along Highway 21 to the St. Helena WWTP. The recently upgraded BJW&SA St. Helena WWTP is an extended aeration type system with gas chlorination. Treated effluent is pumped to Dataw Island where it is spray irrigated on the Cotton Dike and Morgan River golf courses. Effluent is also pumped to a spray site located at a sod farm on St. Helena Island.

Hunting Island State Park utilizes a package treatment plant with chlorination. Treated effluent is discharged to a wetland area behind the main dune line. Fripp Island PSD WWTP also operates a facility at Harbor Island. Treated effluent from Harbor Island is pumped to Fripp Island and treated effluent from both plants is stored in lagoons and spray irrigated onto golf courses.

- B. Industrial wastes** - There are no permitted industrial discharges in Area 16B.
- C. Marinas** - S.C. Regulation 61-47, Shellfish defines Marina as "any water area with a structure (docks, basin, floating docks, etc.) which is: 1) used for docking or otherwise mooring vessels;

and, 2) constructed to provide temporary or permanent docking space for more than ten boats, or has more than 200 linear feet of docking space.” Fripp Island Marina, located on Fripp Island, has a marine sewage pumpout facility. There is a 1000-foot closure zone in place around the marina. Additionally, a 783' radius Prohibited closure zone encompasses the commercial fishing docks at Gay Fish Company on Wards Creek.

- D. **Radionuclides** - Sources of radionuclides have not been identified within Area 16B, and radionuclide monitoring has not been conducted. No other sources of poisonous or deleterious substances have been identified within the area.

NONPOINT SOURCE POLLUTION

- A. **Stormwater** - Land's End Plantation is an approximately 400-lot development that is adjacent to Beaufort River and Station Creek. Stormwater from the site will be directed to the existing interior lagoons and will ultimately discharge to Beaufort River. Stormwater runoff may impact water quality by transporting fecal coliform bacteria (and other pollutants) from land to the shellfish growing area. Stormwater from roads, residences, and agricultural land is directed to the lowest point of elevation - typically the nearest creek or marsh. In addition, there are freshwater wetland areas, ditches, and impoundments that drain into tidal creeks.

Most land disturbing activities in South Carolina must comply with the Stormwater Management and Sediment Reduction Act of 1991. The final regulations, effective on June 26, 1992, establish the procedures and minimum standards for a statewide stormwater management program. For activities in the eight coastal counties, additional water quality requirements are imposed. For all projects, regardless of size, which are located within one-half mile of a receiving water body in the coastal zone, the design criteria for permanent water quality ponds having a permanent pool is storage of the first inch of runoff from the entire site over a 24 -hour period or storage of the first one inch of runoff from the built-upon portion of the property, whichever is greater. Storage may be accomplished through retention, detention, or infiltration systems, as appropriate for the specific site. In addition, for those projects that are located within 1000 feet of shellfish beds, the first one and one half inches of runoff from the built-upon portion of the property must be retained on site. Since 1992, these regulations have been applied to the development of residential subdivisions, golf courses, and business areas.

- B. **Agricultural Waste** - Small numbers of cattle and horses are located in Area 16B.
- C. **Individual Sewage Treatment and Disposal (ISTD) Systems** - The majority of homes adjacent to Area 16B utilize ISTDs for wastewater disposal. Some of the facilities at the Hunting Island State Park were forced to utilize Onsite Wastewater Disposal Systems (OSWDs) as the sewage lift stations were compromised by beach erosion. Construction of new homes is continuing at Fripp Island. Depending on their location, these homes utilize either OSWD's or will be served by the island's sewer system.

- D. **Wildlife and Domestic Animals** - This area supports populations of white-tailed deer, raccoons, wading birds, migratory waterfowl, and other wildlife, which may contribute to fecal coliform levels in some areas. Domestic animals present in the area include dogs, cats, horses, and goats.
- E. **Boat Traffic** - The Harbor River provides access to St. Helena Sound and the Atlantic Ocean for shrimp boats and recreational boaters. Fripp, Pritchards, Skull, and Trenchards Inlets provide access to the Atlantic Ocean. There are three public boat ramps located in Area 16B.
- F. **Hydrographic and Habitat Modification** - Hydrographic and habitat modification in estuarine areas requires both State and Federal approval.
- G. **Marine Biotoxins** - There have been no documented occurrences of toxic algae affecting water quality in Area 16B. The Department participates in a State Task Force on Toxic Algae and maintains a toxic algae emergency response team.

HYDROGRAPHIC AND METEOROLOGICAL CHARACTERISTICS

PHYSIOGRAPHY

Area 16B is part of the St. Helena Sound estuary which is a drowned river valley/bar built system containing numerous marsh islands and tidal creeks. It is among the largest of the South Atlantic estuaries. The average depth of the estuary is approximately 12 feet at mid-tide level. Extensive shallow areas and numerous tidal flats exist within the estuary.

Tides - Tides in Area 16B are semidiurnal, consisting of two low and high tides each lunar day. Mean tidal range is 5.9 feet during normal tides and 6.9 feet during spring tides. The greatest tidal ranges of the year typically occur around full moon during the months of September through December. Wind speed and direction may cause significant variation in predicted tide heights.

Rainfall - Rainfall data used in this survey is collected at a weather station located at the City of Beaufort WWTP (station 380559- Beaufort 7 SW). The rainfall gauge is typically read at approximately 7:00 AM and the rainfall amount is recorded for that date. As most shellfish samples are collected after 7:00 AM, the rainfall for the sample date + 24 hours has been added to the rainfall summary table. Rainfall for the sample date + 24 hours may correlate better and help to explain elevated fecal coliform concentrations in sample results, particularly if there was zero rainfall on the date of or prior to sampling.

Annual rainfall recorded at the Beaufort 7SW weather station was significantly below the 30-year normal amount for 2000 and 2001 (see Chart Beaufort Annual Rainfall). Below normal rainfall continued through May 2002 and by August 2002, the drought status of all 46 counties in the state, including Beaufort and Colleton, had been upgraded to extreme. Above normal rainfall beginning in late

August, however, led the S.C. Drought Response Committee to downgrade the drought status statewide and remove the drought declaration for Beaufort, Charleston, and Colleton counties on November 21, 2002.

Annual rainfall averages 51.15", with August being the wettest month. Charts showing yearly rainfall amounts for the years 1998 through 2003 are attached. Approximately 40% of the annual rainfall falls in the three-month period from June to August. Weather patterns during this time period are often characterized by thunderstorms and thundershower activity of short duration. In addition, these three months also have the highest numbers of days with rainfall greater than 1". The months of December through March historically have the greatest number of days with rainfall exceeding 0.10" and 0.50". Rainfall events during these months are typically of a longer duration.

Winds - The prevailing wind direction between February and September ranges between South and South Southwest (180 to 200 degrees) and between October and January is North Northeast (20 degrees). The annual mean wind speed is 8.5 MPH, with August having the lowest (7.3 MPH) and March the highest (10.0 MPH) mean wind speed.

River discharges - The South Edisto River originates in the midlands of South Carolina and flows approximately 140 miles through the piedmont and coastal plain until it enters the Atlantic Ocean at Edisto Beach. It is the St. Helena Sound estuary's major freshwater source. The river discharges at an average rate of 2,631 cubic feet per second. The Ashepoo River and Salkahatchie/Combahee Rivers also contribute to freshwater input, but to a lesser degree.

WATER QUALITY STUDIES

DESCRIPTION OF THE PROGRAM

The Department currently utilizes a systematic random sampling (SRS) strategy within Area 16B in lieu of sampling under adverse pollution conditions. In order to comply with NSSP guidelines, a minimum of thirty samples are required to be collected and analyzed from each station during the review period. Sampling dates are computer generated prior to the beginning of each quarterly period thereby insuring random selection with respect to tidal stage and weather. Day of week selection criteria is limited to Mondays, Tuesdays, and Wednesdays due to shipping requirements and laboratory manpower constraints. Sample schedules are rarely altered.

During July, 1998, an updated data analysis procedure was formalized. Samples utilized for classification purposes are limited to those samples collected in accordance with the SRS for a 36-month period beginning January 1 and ending December 31. This allows for a maximum of 36 samples per station yet provides a six-sample "cushion" (above the NSSP required 30 minimum) for broken samples, lab error, breakdowns, etc. This also allows each annual report to meet the NSSP Triennial Review sampling criteria.

Five hundred and sixty (560) surface water quality samples (<1.0 ft. deep) were collected for bacteriological analyses and classification purposes at 16 active water quality sampling stations in Area 16B during the period January 1, 2001 through December 31, 2003.

The samples were collected in 120 ml amber glass bottles, immediately placed on ice and transported by bus to the South Carolina Department of Health and Environmental Control's Trident District Environmental Quality Control laboratory at North Charleston, South Carolina. An additional 120 ml water sample was included with each shipment as a temperature control. Upon receipt at the laboratory, sample sets that exceeded a 30-hour holding time or contained a temperature control of 0 degrees C. or > 10 degrees C. were discarded. Samples collected after September 1, 1986 have been analyzed using the five tube/three dilution modified A-1 method described by Nuefeld (1985).

Surface water temperatures were measured utilizing hand-held, laboratory-quality calibrated centigrade thermometers. Salinity measurements were measured in the laboratory using automatic temperature compensated refractometers. Additional field data include ambient air temperature, wind direction, tidal stage and date and time of sampling. Tidal stages were determined Nautical Software's Tides and Currents, Version 2 (1996).

MONITORING RESULTS

All stations within Area 16B meet the statistical criteria for an Approved classification.

CONCLUSIONS

Based on review of fecal coliform bacteriological data and the pollution source survey, Area 16B is minimally impacted by two sources of actual or potential pollution.

NONPOINT SOURCE RUNOFF

Stormwater runoff appears to be the source of the minimal fecal coliform bacteria contamination in Area 16B. The impact of rainfall on water quality appears to be greatest in tidal creeks close to developed areas, such as Old House Creek and Station Creek. Analysis of rainfall associated with sample MPN values exceeding 43 indicates that the cumulative effect of moderate amounts of rainfall for two or three successive days prior to sampling may have infrequent, temporary adverse impact on water quality. Most of these samples were also collected at or near low tide- another indication that the source may be runoff. Possible sources of fecal coliform bacteria contamination include failing septic systems, pets, domestic animals such as horses and cows, wildlife, and drainage from roads and freshwater wetlands.

INDIVIDUAL SEWAGE TREATMENT AND DISPOSAL SYSTEMS

Almost all homes adjacent to shellfish waters in Area 16B are served by ISTDs. Soils in most areas are considered to be suitable for ISTDs and systems should operate properly if maintained.

However, many older systems may not meet current standards. There are also a number of fish camp houses utilizing ISTDs which are located on small islands throughout Area 16B.

RECOMMENDATIONS

The shoreline survey and bacteriological data review of shellfish Management Area 16B indicate that no classification changes are necessary (See Figures 2 and 3).

The following classification is recommended:

Prohibited: (Administrative closure)

- 1) Fripp Island Marina closure zone (approximately 1000 feet)
- 2) Fripp canal, from station 06F at Old House Creek to its confluence with Skull Inlet
- 4) Gay Fish Company Shrimp Dock closure zone (approximately 783' radius from center)

Restricted: None

Conditionally Approved: None

Approved: The remaining waters of Area 16B

Station Addition/Deactivation/Modification: None

Analysis of sampling data for Area 16B demonstrates the probability of a significant impact from rainfall exceeding 4.00" in a 24 hour period. Therefore, a precautionary closure of Area 16B will be implemented following rainfall events of greater than 4.00" in a 24 hour period, as measured at the Beaufort-7-SW Weather Station. This methodology is associated with the concept of the Probable Maximum Precipitation (PMP). PMP estimates for the coastal United States has been published in a series of hydro-meteorological reports (HMRs) by the National Weather Service (National Weather Service). PMP estimates for South Carolina's growing areas are derived from HMRs 51, 52, and 53 (National Research Council, 1985).

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TABLE #1
Shellfish Management Area 16B
WATER QUALITY SAMPLING STATIONS DESCRIPTION

<u>Station</u>	<u>Description</u>
02	Trenchard's Inlet at Mouth of Station Creek
03	Club Bridge Creek at Harbor River Sound
04	Story River at Fripp Island
05	Old House Creek at Fripp Inlet
06	Harbor River at Marker #A-13
06f	Unnamed Creek - Fripp Canal at Old House Creek
17	Station Creek SSG - Beaufort County Landing
20	Two Miles North of Confluence of Story River and Trenchard's Inlet
21	Unnamed Creek Between Harbor River and Story River
22	Skull Creek at Confluence of Creek Leading to Pritchard's Inlet
26	Old House Creek at Confluence of Two Tributaries in Headwaters Northwest of Fripp Island Marina
29	Midway Stations 3 and 6 at Unnamed Creek Between Story River & Harbor River
31	Johnson Creek at SC Highway 21 bridge
33	Skull Creek at confluence with Trenchard's Inlet
34	Skull Creek, Midway Between Skull Inlet and Trenchard's Inlet at Confluence with Large Tributary on Northwest Side of Skull Creek
35	Skull Creek at Confluence with First Major Creek on Right Heading Inland from Skull Inlet
(Total 16)	

Figure 1.
Shellfish Management
Area 16B
Prior Classification

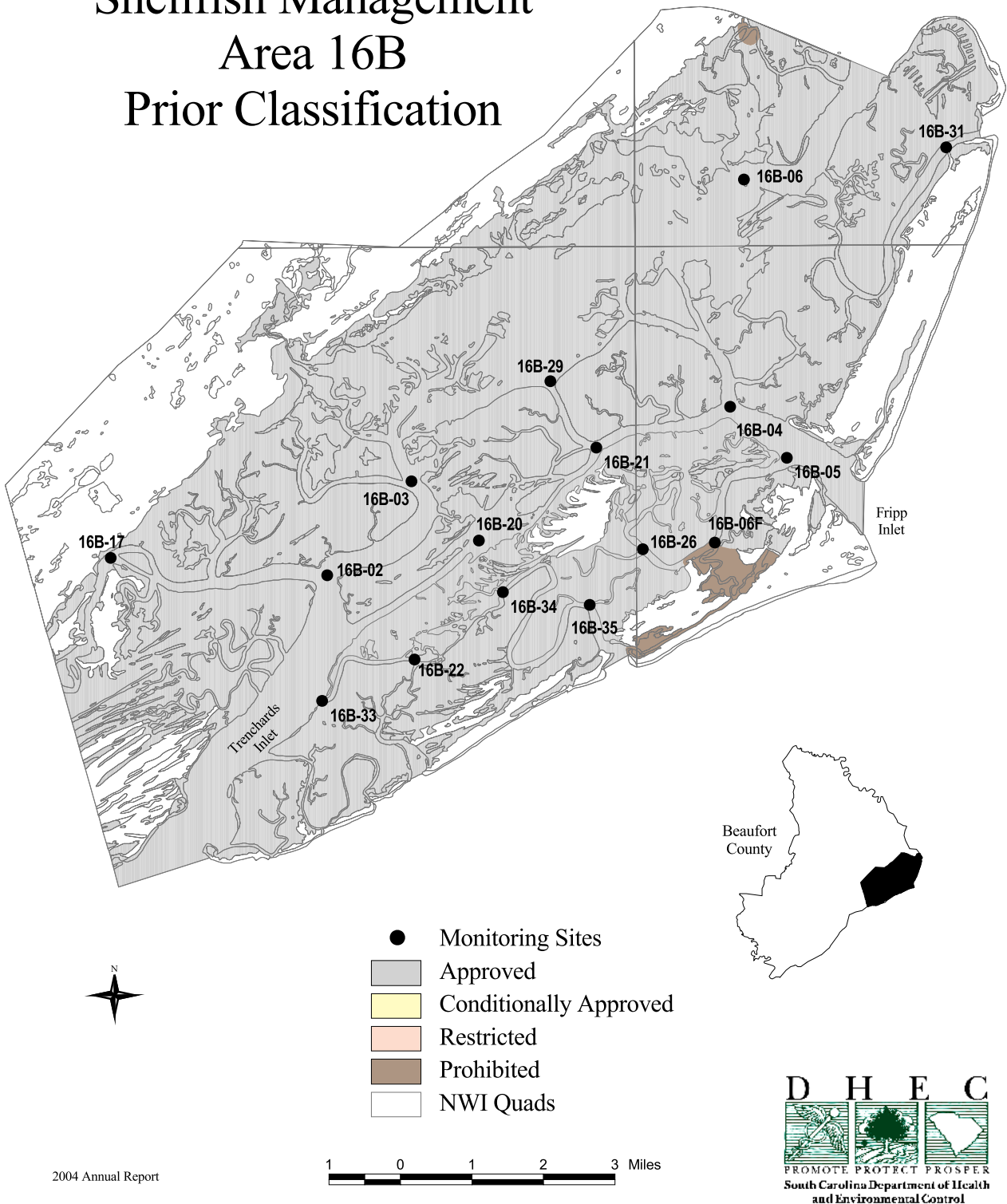


Figure 2.
Shellfish Management
Area 16B
Current Classification

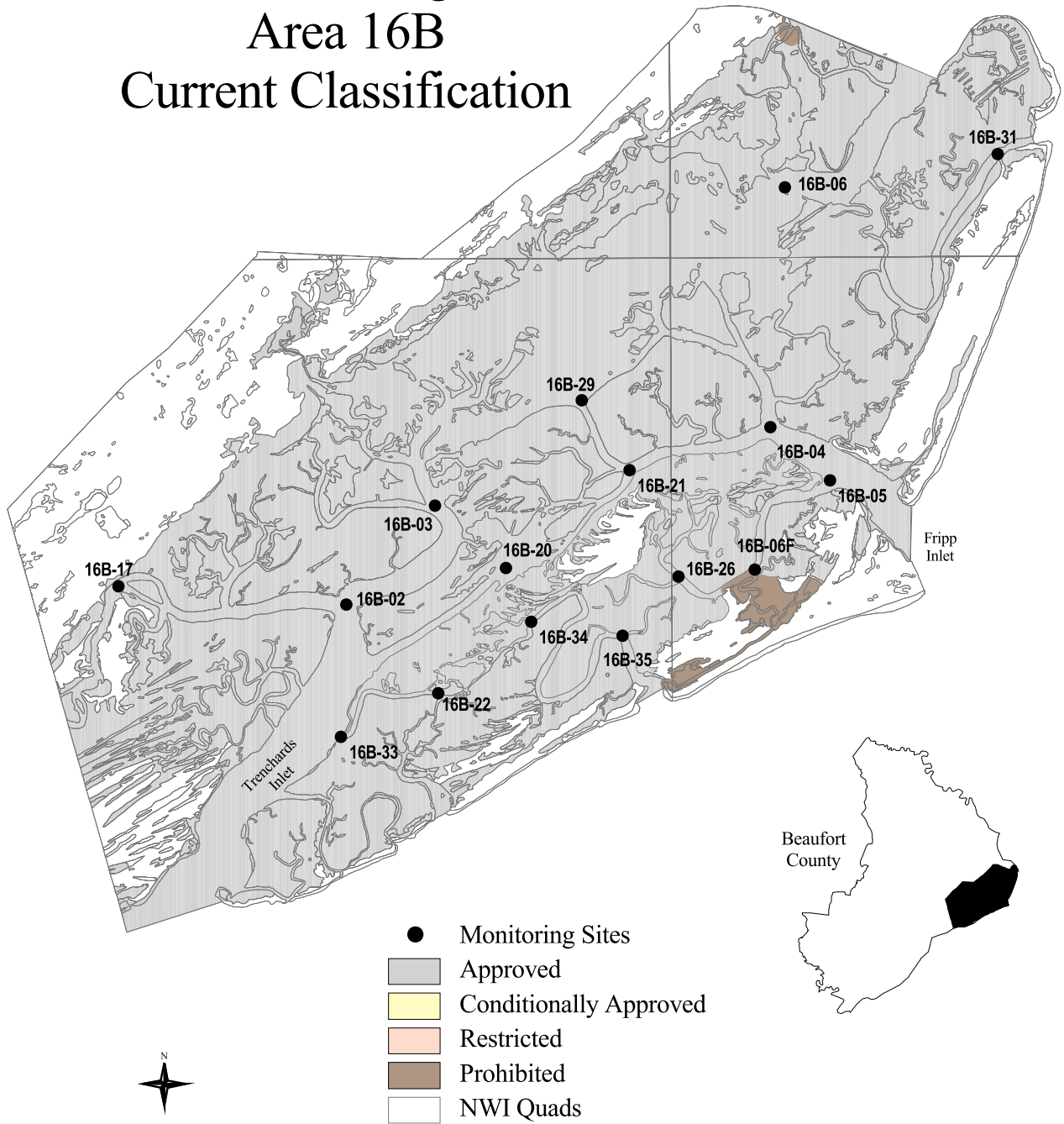


Figure 3. Shellfish Management Area 16B Potential Pollution Sources

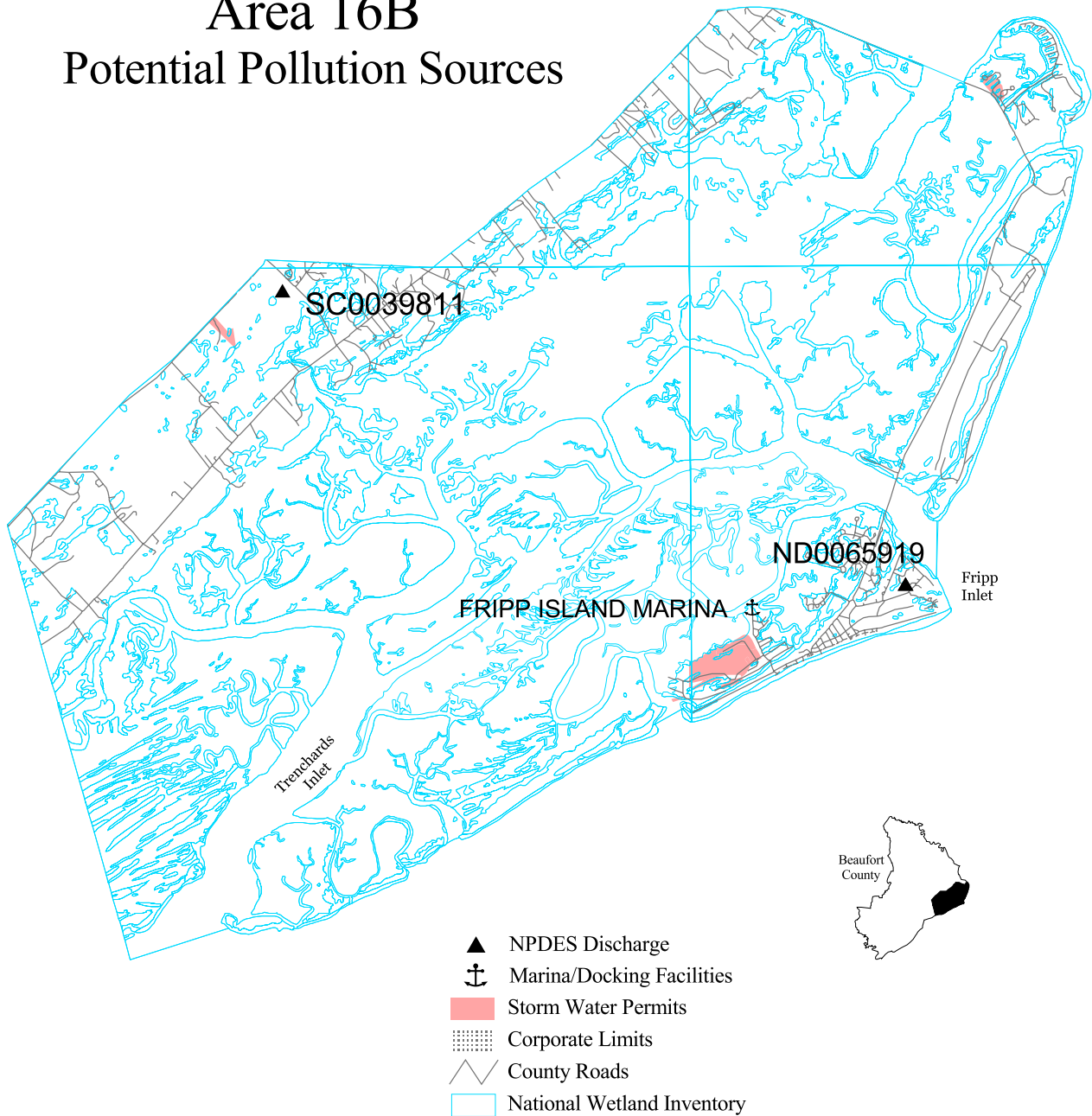


TABLE #2
Shellfish Management Area 16B

FECAL COLIFORM BACTERIOLOGICAL DATA SUMMARY
from Shellfish Water Quality Sampling Stations between

January 1, 2001 and December 31, 2003

Station #?	02	03	04	05	06	06F	17	20	21	22	26
SAMPLES	35	35	35	35	35	35	35	35	35	35	35
GEO MEAN	2.2	2.2	2.2	2.9	2.4	4.3	2.7	2.7	2.2	6.1	4.5
90TH %ILE	3	3	3	8	4	13	6	6	3	25	13
WATER QLTY	A	A	A	A	A	A	A	A	A	A	A
CLASSIFICATION	A	A	A	A	A	P	A	A	A	A	A

Station #?	29	31	33	34	35						
SAMPLES	35	35	35	35	35						
GEO MEAN	2.1	3.7	3.0	3.8	3.0						
90TH %ILE	3	10	8	11	7						
WATER QLTY	A	A	A	A	A						
CLASSIFICATION	A	A	A	A	A						

A - Approved **CA** - Conditionally Approved **R** - Restricted
RND - Restricted/No Depuration **P** - Prohibited

TABLE #3

Water Quality Sampling Stations Data

Shellfish Management Area 16B

BACTERIOLOGICAL DATA

Data for each shellfish station listed in this report's "Fecal Coliform Bacteriological Data Summary Table" and in other shellfish reports, can be obtained through South Carolina's Department of Health and Environmental Control - Freedom of Information office at the address below.

Freedom of Information
2600 Bull Street
Columbia, SC 29201

Any explanation or clarity needed on the report's content can be obtained by contacting the preparer(s), and/or reviewer(s) listed on the cover page.

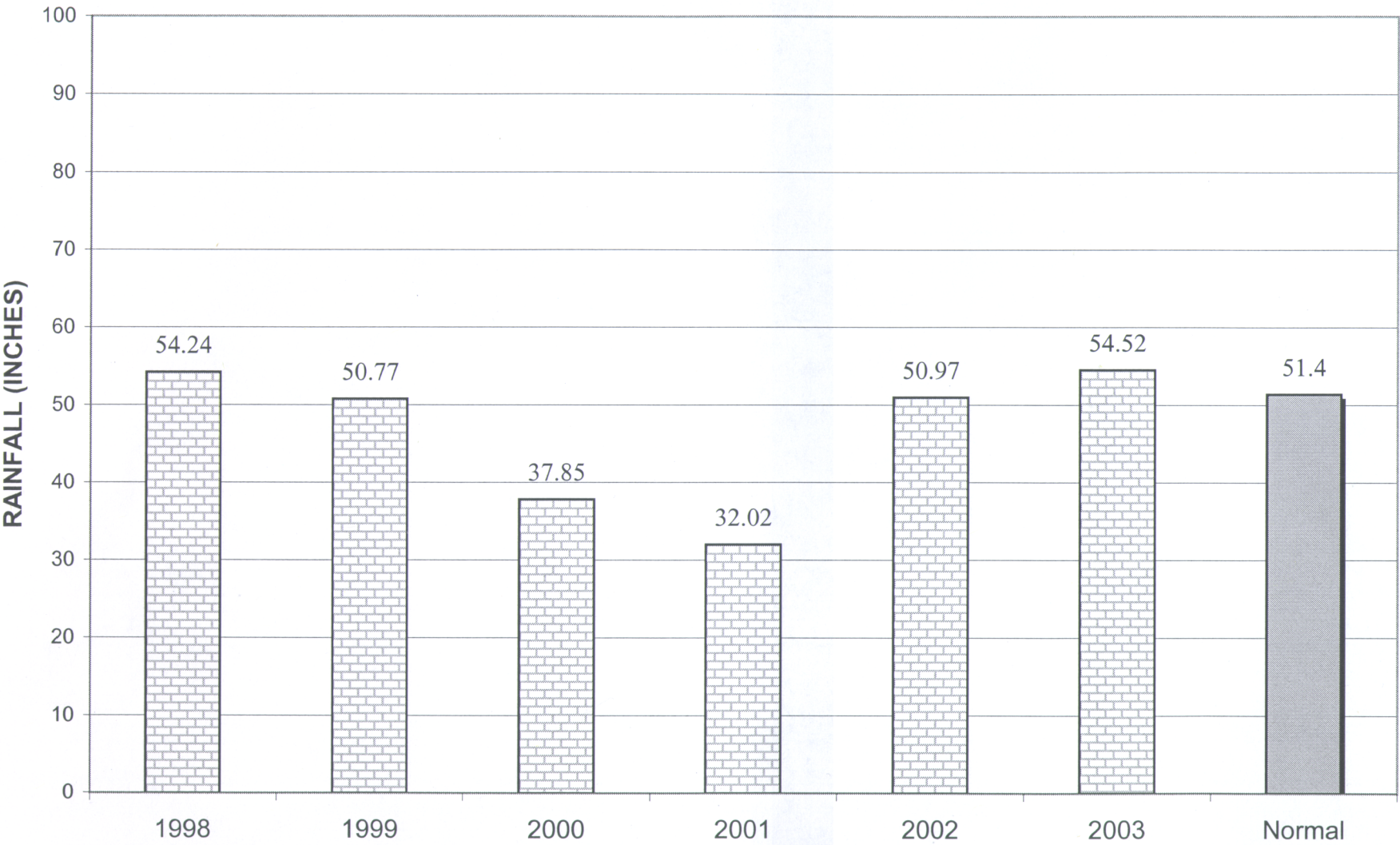
TABLE #4

Rainfall Data

Shellfish Management Area 16B

SOURCE : NOAA/National Weather Service
National Climatic Data Center, Asheville, North Carolina 28801

BEAUFORT ANNUAL RAINFALL 1998-2003



ANNUAL TABLE OF DAILY RAINFALL DATA

SOURCE: City of Beaufort Wastewater Treatment Plant

Beaufort, SC (Station #380559 / 7-SW)

2001	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	--	0.00	0.00	0.00
2nd	0.00	0.00	0.00	0.00	0.00	--	0.04	0.00	--	0.00	0.00	0.00
3rd	0.00	0.00	0.03	0.00	0.00	--	0.02	0.00	--	0.00	0.00	0.00
4th	0.00	0.18	0.85	0.04	0.00	0.41	0.42	0.00	0.75	0.00	0.00	0.00
5th	0.00	0.08	0.02	0.00	0.00	--	0.59	0.01	1.30	0.00	0.00	0.00
6th	0.00	0.00	0.00	0.00	0.00	--	0.00	0.10	0.13	0.00	0.00	0.00
7th	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.23	0.25	0.00	0.00
8th	0.02	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.23	0.00	0.00	0.00
9th	0.31	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.02	0.00	0.00	0.48
10th	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.02	0.05	0.00	--	0.00
11th	0.00	0.06	0.00	0.00	0.00	0.05	0.00	--	0.00	0.00	--	0.63
12th	0.10	0.70	0.00	0.00	0.00	1.30	0.00	0.00	0.05	0.02	0.00	0.06
13th	0.09	0.06	0.77	0.00	0.00	--	1.06	1.58	0.00	--	0.00	0.00
14th	0.00	0.02	0.00	0.20	0.00	0.20	0.28	0.66	0.00	--	0.00	0.00
15th	0.00	0.00	0.15	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	--
16th	0.00	0.00	0.80	0.20	0.00	--	0.00	0.00	0.00	0.00	0.00	--
17th	0.00	0.11	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	--	0.00
18th	0.03	0.00	0.00	0.00	0.00	0.04	0.00	2.37	0.00	0.00	--	0.07
19th	0.00	0.00	0.00	0.00	0.00	--	0.00	2.30	0.00	0.00	0.00	0.00
20th	0.45	0.00	1.05	0.00	0.00	0.22	0.00	0.45	0.00	--	0.00	0.00
21st	0.00	0.00	0.51	0.00	0.00	0.11	--	1.02	0.00	--	0.00	0.00
22nd	0.00	0.03	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00
23rd	0.00	0.35	0.00	0.00	0.05	0.04	0.03	0.00	--	0.00	--	0.00
24th	0.00	0.00	0.00	0.00	0.00	0.05	1.00	0.00	0.04	0.00	0.00	0.02
25th	0.00	0.00	0.01	0.00	0.00	--	1.10	0.00	0.90	0.00	0.03	0.00
26th	0.00	0.06	0.00	0.27	0.00	0.28	0.03	0.00	0.01	0.00	0.00	0.00
27th	0.00	0.00	0.00	0.00	0.00	0.28	0.08	0.00	0.00	0.00	0.00	0.00
28th	0.00	0.01	0.00	0.00	0.00	0.01	--	0.00	0.00	--	--	0.00
29th	0.00		0.21	0.00	0.00		--	0.00	0.00	0.00	0.00	0.00
30th	0.00		0.95	0.00	0.40		0.00	0.02	0.00	0.00	0.00	0.00
31st	0.80		0.03		0.00		0.00			0.00		0.00

(Monthly Figures)

Year's Rainfall Total: 32.02

SUM	1.80	1.66	5.38	0.71	0.45	3.57	4.65	8.53	3.71	0.27	0.03	1.26
MAX	0.80	0.70	1.05	0.27	0.40	1.30	1.10	2.37	1.30	0.25	0.03	0.63
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.06	0.06	0.17	0.02	0.01	0.22	0.17	0.29	0.15	0.01	0.00	0.04

Note:"--" denotes missing data

(Shellfish Management Areas 14, 15, 16A, 16B, 17, 18, 19)

ANNUAL TABLE OF DAILY RAINFALL DATA

SOURCE: City of Beaufort Wastewater Treatment Plant

Beaufort, SC (Station #380559 / 7-SW)

2002	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.00	0.00	2.60	0.00	0.00	--	0.81	0.65	0.05	0.00	0.00
2nd	0.10	0.00	--	0.00	0.00	0.00	0.00	0.02	0.06	0.15	0.00	0.00
3rd	0.50	--	--	0.00	0.00	0.00	0.00	--	0.16	0.00	0.00	0.00
4th	0.08	0.00	0.05	0.00	--	0.00	0.00	0.02	0.00	--	0.00	0.00
5th	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.25	0.00
6th	--	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.78	0.13
7th	0.00	1.01	0.00	0.00	0.00	0.00	--	0.49	0.00	0.02	0.04	--
8th	0.00	0.25	0.00	0.02	--	0.00	0.00	0.00	0.00	0.00	0.00	--
9th	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
10th	0.00	0.27	0.00	0.41	0.00	0.00	0.28	0.00	--	1.85	1.12	0.73
11th	0.00	0.15	0.00	0.04	0.00	0.00	0.00	0.00	0.00	--	0.00	0.35
12th	0.00	0.00	0.00	--	0.00	0.00	2.16	0.00	0.00	0.04	1.20	0.04
13th	--	0.00	0.35	0.00	0.00	0.00	--	0.00	--	0.04	0.89	0.56
14th	0.00	0.00	0.00	0.00	0.11	0.00	0.60	0.07	0.90	0.05	0.00	0.03
15th	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.02	0.00	0.00
16th	0.00	--	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17th	0.00	--	--	0.00	0.00	--	0.00	--	0.00	0.00	1.59	0.00
18th	0.00	0.00	0.03	0.00	0.00	0.02	0.00	0.25	0.22	0.00	0.03	0.00
19th	--	0.00	0.00	0.00	1.10	0.63	0.00	0.02	0.16	0.00	0.00	0.04
20th	--	0.00	0.00	0.00	0.00	3.85	--	0.00	0.11	0.00	0.00	0.20
21st	0.00	0.21	0.18	0.00	0.00	1.21	1.97	0.00	0.00	0.00	0.00	0.02
22nd	0.10	0.00	0.20	0.00	--	0.01	0.00	0.00	0.58	0.00	0.09	0.00
23rd	0.01	0.01	0.00	0.00	0.00	0.76	0.85	0.00	1.20	0.00	0.00	0.00
24th	0.00	0.04	--	0.00	0.00	0.92	0.01	0.04	0.00	0.09	0.00	0.08
25th	0.01	0.00	0.00	0.00	--	0.78	0.60	0.84	0.84	0.09	0.00	1.33
26th	0.14	0.00	0.00	--	0.00	0.01	0.00	0.30	0.51	0.00	0.00	0.00
27th	0.00	0.00	0.48	--	0.00	0.00	0.00	--	--	0.00	0.00	0.00
28th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	--	0.49	0.00	0.00
29th	0.00		0.00	0.00	0.00		0.00	2.23	2.05	0.38	0.00	0.00
30th	0.00		0.00		0.00		0.00	1.50		0.00	0.00	0.00
31st	0.00		--		0.00		0.00					0.00

(Monthly Figures)

Year's Rainfall Total: 50.97

SUM	1.34	1.96	1.29	3.14	1.21	8.19	6.48	6.59	8.00	3.27	5.99	3.51
MAX	0.50	1.01	0.48	2.60	1.10	3.85	2.16	2.23	2.05	1.85	1.59	1.33
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.05	0.08	0.05	0.12	0.04	0.30	0.24	0.26	0.32	0.12	0.20	0.13

Note:"--" denotes missing data

(Shellfish Management Areas 14, 15, 16A, 16B, 17, 18, 19)

ANNUAL TABLE OF DAILY RAINFALL DATA

SOURCE: City of Beaufort Wastewater Treatment Plant

Beaufort, SC (Station #380559 / 7-SW)

2003	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.32	0.00	0.00	0.00	0.00	1.00	0.02	0.00	0.22	0.00	0.00	0.00
2nd	0.00	0.00	0.47	0.00	0.00	0.00	0.61	0.14	0.00	0.00	0.00	0.00
3rd	0.00	0.00	0.01	0.00	0.10	0.00	0.84	0.00	0.00	0.00	0.00	0.00
4th	0.00	0.02	0.33	0.00	0.03	0.86	0.00	0.00	0.03	0.00	0.06	0.47
5th	0.00	0.03	0.08	0.00	0.00	0.51	0.03	0.56	0.02	0.00	0.05	0.44
6th	0.00	0.00	0.02	0.03	0.00	0.00	0.01	0.00	2.10	0.00	0.00	0.00
7th	0.00	0.42	1.04	0.09	0.43	0.16	0.00	0.30	0.15	0.01	0.00	0.00
8th	0.00	0.03	0.55	0.96	0.00	0.70	0.05	0.00	0.27	0.02	0.00	0.00
9th	0.00	0.00	0.02	1.26	0.00	0.36	0.00	0.00	0.15	0.07	0.00	0.00
10th	0.00	0.12	0.01	0.72	0.00	0.00	0.00	0.04	0.04	0.00	0.00	0.00
11th	0.00	0.31	0.00	0.15	0.00	0.00	0.00	0.02	0.00	0.02	0.00	--
12th	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13th	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00
14th	0.00	0.00	0.56	0.00	0.00	0.66	0.11	0.00	0.00	0.00	0.00	0.33
15th	0.00	0.00	0.21	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00
16th	0.00	0.00	0.15	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17th	0.00	1.40	0.02	0.00	0.12	0.25	0.00	0.08	0.00	0.00	0.00	0.02
18th	0.00	0.05	0.38	0.00	1.92	0.26	0.00	0.36	0.00	0.07	0.00	0.00
19th	0.00	0.00	0.10	0.00	2.80	1.14	0.00	2.42	0.00	0.00	0.00	0.00
20th	0.00	0.00	0.11	0.00	0.00	0.00	3.95	0.00	0.00	0.00	0.36	0.00
21st	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.00
22nd	0.03	0.02	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23rd	0.23	0.58	0.00	0.00	3.01	0.00	0.00	0.00	0.25	0.00	0.00	0.00
24th	0.00	0.00	0.00	0.00	0.00	0.00	1.85	0.00	0.05	0.00	0.00	0.04
25th	0.00	0.00	0.00	0.00	0.04	0.00	1.29	0.16	0.00	0.00	0.00	0.00
26th	0.00	0.00	0.00	1.34	0.16	0.00	0.62	0.51	0.00	0.00	0.00	0.00
27th	0.00	0.45	0.00	0.46	0.11	0.00	0.20	0.03	0.00	0.00	0.00	0.00
28th	0.00	0.09	0.01	0.00	0.00	0.00	0.63	0.00	0.00	0.25	0.00	0.00
29th	0.00		0.00	0.00	0.00	1.00	0.36	0.00	0.00	2.60	0.21	0.00
30th	0.00		0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00
31st	0.00		0.30		0.00		0.00	0.00		0.00		0.00

(Monthly Figures)

Year's Rainfall Total: 54.52

SUM	0.58	3.52	4.75	5.08	9.00	7.05	11.17	5.07	3.28	3.04	0.68	1.30
MAX	0.32	1.40	1.04	1.34	3.01	1.14	3.95	2.42	2.10	2.60	0.36	0.47
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.02	0.13	0.15	0.17	0.29	0.24	0.36	0.16	0.11	0.10	0.02	0.04

Note:"--" denotes missing data

(Shellfish Management Areas 14, 15, 16A, 16B, 17, 18, 19)

Shellfish Management Area 16B
A SUMMARY OF RAINFALL
During and Prior To Fecal Coliform Sampling

Sample Date	Sample Date + 24 hours	Sample Date	Sample Date - 24 hours	Sample Date - 48 hours	Sample Date - 72 hours
01/08/01	0.31"	0.02"	0.00"	0.00"	0.00"
02/06/01	0.00"	0.00"	0.08"	0.18"	0.00"
03/05/01	0.00"	0.02"	0.85"	0.03"	0.00"
04/18/01	0.00"	0.00"	0.00"	0.20"	0.00"
05/07/01	0.00"	0.00"	0.00"	0.00"	0.00"
06/19/01	0.04"	no data	no data	no data	no data
07/16/01	0.00"	0.00"	0.00"	0.28"	1.06"
08/07/01	0.00"	no data	0.10"	0.01"	0.00"
09/25/01	0.01"	0.90"	0.04"	no data	no data
10/03/01	0.00"	0.00"	0.00"	0.00"	0.00"
11/13/01	0.00"	0.00"	0.00"	no data	no data
12/10/01	0.63"	0.00"	0.48"	0.00"	0.00"
01/23/02	0.00"	0.01"	0.10"	0.00"	no data
02/19/02	0.00"	0.00"	0.00"	no data	no data
03/18/02	0.00"	0.03"	no data	no data	0.00"
04/16/02	0.00"	0.00"	0.00"	0.00"	no data
05/21/02	no data	0.00"	0.00"	1.10"	0.00"
06/10/02	0.00"	0.00"	0.00"	no data	0.00"
07/08/02	0.00"	0.00"	no data	0.01"	0.00"
08/13/02	0.07"	0.00"	0.00"	0.00"	0.00"
09/03/02	0.00"	0.16"	0.06"	0.65"	1.50"
10/02/02	0.00"	0.15"	0.05"	2.05"	no data
11/14/02	0.00"	0.00"	0.89"	1.20"	0.00"
12/18/02	0.04"	0.00"	0.00"	0.00"	0.00"
01/08/03	0.00"	0.00"	0.00"	0.00"	0.00"
02/12/03	0.00"	0.00"	0.31"	0.12"	0.00"
03/10/03	0.00"	0.01"	0.02"	0.55"	1.04"
04/16/03	0.00"	0.00"	0.00"	0.00"	0.00"
05/20/03	0.00"	0.00"	2.80"	1.92"	0.12"
06/18/03	1.14"	0.26"	0.25"	0.00"	0.00"
07/21/03	0.00"	0.00"	3.95"	0.00"	0.00"
08/04/03	0.56"	0.00"	0.00"	0.14"	0.00"
09/16/03	0.00"	0.00"	0.00"	0.00"	0.00"
10/15/03	0.00"	0.00"	0.00"	0.00"	0.00"
11/24/03	0.00"	0.00"	0.00"	0.00"	0.00"
12/08/03	0.00"	0.00"	0.00"	0.00"	0.44"

Amounts Shown Are per Day, not Cumulative / Station 380559 - Beaufort 7 - SW